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COMPLIMENTS OF  
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## RELATION OF DENTAL AFFECTIONS TO DISEASES OF THE EYE.\*

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That a fixed relation exists between the teeth and the eyes through the fifth cranial or trigeminal nerve is well known, but in order to more thoroughly understand this relationship it is necessary to briefly review the anatomy and the distribution of this nerve. The fifth cranial nerve is the sensory nerve of the muscles of the face and the motor nerve of the muscles of mastication. It arises by two roots, one of which is sensory and takes its origin from the side of the pons Varolii and from the nucleus near the margin of the fourth ventricle in the brain; the other, the motor root, originates in a nucleus on the floor of the fourth ventricle internal to that of the sensory root. These roots run forward between the bone and dura mater to the apex of the petrous portion of the temporal bone, where the fibers of the sensory root form the Gasserian ganglion. The motor root passes beneath it without being connected with it, joining one of its trunks outside the cranium. The Gasserian ganglion gives off three large branches—the ophthalmic, the superior maxillary, and the inferior maxillary nerves.

The ophthalmic is a sensory nerve and supplies the eyeball, lacrimal gland, mucous membrane of the eye and nasal fossæ, and the integument of the eyebrow, forehead, and nose. It joins with filaments from the cavernous plexus of the sympathetic, the third, the sixth, and sometimes the fourth cranial nerve. It divides into three branches; the lacrimal, frontal, and nasal. The nasal branch further subdivides into ganglionic, ciliary, and infratrochlear filaments. The ganglion branch passes forward between the two heads of the external rectus on the outer side of the optic nerve, joining a branch from the third or oculomotor nerve and filaments from the cavernous plexus of the sympathetic to those from the ophthalmic ganglion. Its

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branches of distribution are about ten short ciliary nerves which supply the ciliary muscle, iris, and cornea. The ciliary branches of the nasal branch are the long ciliary nerves and are also distributed to the iris, ciliary body, and cornea, joining the short ciliary nerves.

Thus far the fifth nerve is distributed to the various important structures of the eye. The dental innervation depends upon the various filaments of the two remaining branches, the superior and inferior maxillary nerves. The superior maxillary nerve commences at the middle of the Gasserian ganglion and passes forward through the foramen rotundum, crosses the spheno-maxillary fossa, enters the orbit through the spheno-maxillary fissure, traverses the infraorbital canal in the floor of the orbit, and appears upon the face at the infraorbital foramen. Its branches of distribution are meningeal, orbital, spheno-palatine, posterior superior dental, middle superior dental, anterior superior dental, palpebral, nasal, and labial. The inferior maxillary nerve is made up of two roots, a sensory root from the Gasserian ganglion, and a motor root which passes beneath the ganglion and unites with the sensory root just after its exit from the foramen ovale. It divides into an anterior and posterior trunk. The anterior trunk gives off the following branches—masseteric, temporal, buccal, and external pterygoid nerves, and the posterior trunk subdivides into the auriculo-temporal, lingual, and inferior dental nerves. Three ganglia are found along the course of the superior and inferior maxillary nerves, namely, the spheno-palatine, otic, and submaxillary ganglia, but as they have no bearing upon the subject under discussion their description will be omitted.

From the description of the fifth nerve just given it will be readily seen that affections situated at the termination of any of its branches may be readily referred to the terminal filaments of other branches or widely diffused over the entire nerve. Trophic disturbances of the nerve are also likely to be attended by trophic alterations in the eyes or teeth or other structures to which the nerve is distributed. Disorders of nutrition of the body in general are also manifested through the fifth nerve by changes in the eyes and teeth. As examples of which may be mentioned the association of Hutchinson's teeth with syphilitic interstitial keratitis, and the rachitic teeth with

various corneal conditions. Hypersensitiveness, pain, and intense neuralgia of the fifth nerve may be due to pathologic changes in the cornea, iris, or ciliary body in the eye or to some diseased condition of the teeth.

This relationship between the teeth and the eyes through the medium of the fifth nerve has been the subject of discussion for a number of years. H. Powers (*Trans. Odont. Soc. Gr. Brit.*, London, 1883-4, XVI, page 56) studied this subject in detail and found that dental lesions were very frequently the cause of diseases of the eye. He called attention to the necessity of carefully examining the teeth in threatening glaucoma, especially when associated with ciliary neurosis and with obscure temporal and orbital pain, mydriasis, myosis, sudden paralysis of some of the orbital muscles and loss of sensation in the absence of cerebral symptoms, phlyctenulæ and corneal ulcers (especially in children), sudden failure of accommodation, and exophthalmos. According to his deductions the irritation produced by the diseased teeth may affect the eye by—*inhibition, trophic or vasomotor influence, extension of neuritis, and reflex irritation or sympathy.*

G. T. Stevens (*Intern. Dent. Jour.*, XII, pages 145-147) also contributes to our knowledge upon this subject. He states that spasm of accommodation is not infrequent as a result of carious teeth. His extensive work in anomalies in the extraocular muscles leads him to believe that disturbances of these muscles are liable to prevent the proper development of the teeth by the neurasthenic phenomena they induce. He states that the deformity known as wedge-shaped jaw progresses as does myopia in many cases, and that in his experience it is always associated with disturbances of the equilibrium of the extraocular muscles. Stevens observed in 1877 (*Medical Record*) a case of obstinate trifacial neuralgia referable to the teeth in one of his patients which was relieved by the wearing of proper correcting lenses. This patient was highly astigmatic and much credit is due Dr. Stevens, as the association of pain in the head with astigmatism had been demonstrated but two or three years before by Dr. S. Weir Mitchell. He also stated at this time that he himself suffered most agonizing neuralgic pain and had a tooth removed by his dentist but with no relief. He then discovered that the pain was associated directly with an excessive amount of eye-

work, and it disappeared completely as soon as his ocular work was lessened.

Galezowski's (*Revue Generale d' Opth.*, Oct., 1888) observations at this period are also very interesting. He states that during the first dentition many rebellious cases of corneal disease arise from the reflex irritation induced by the difficult eruption of the teeth. He also believes that neuralgic affections about the orbit often arise from second dentition. Dental caries is often manifested by accommodative asthenopia, particularly in the absence of refraction errors. He also relates a case of unilateral blindness without any visible fundal lesion which he thinks arose from the extraction of a tooth. Brubaker (*Litch, A System of American Dentistry*) relates a case of amaurosis of twelve years' duration which was cured within a few days after the extraction of a diseased tooth, and a somewhat similar case in a woman thirty-four years of age was reported by W. W. Allport of Chicago (*Jour. Amer. Med. Assn.*, 1883, page 637). Dewitt (*Amer. Jour. N. S.* CX, 1868, April, page 382) described a case of unilateral blindness that was due to the same cause and was relieved by attention to the teeth.

Less common than the preceding are the affections of the iris, choroid, and lens that have been attributed to diseased teeth. H. Sevell (*Lancet*, 1884, page 709) in a paper read before the Harveian Society of London reported a case in which spasm of the muscles of the face and cataract followed dental irritation in a middle-aged lady who suffered greatly from neuralgia. Extraction of the diseased teeth in this case caused a cessation of the neuralgia and facial spasm, but the lenticular opacity persisted but did not progress. Mr. Juler reported before the same society a case of recent choroiditis near the posterior pole of the eye in a girl seventeen years of age, in whom removal of a carious tooth on the left side of the upper jaw resulted in a marked improvement in vision. He stated that he had also observed cyclitis and vitreous opacities in another case which could be directly traced to diseased teeth. In another case under his care the patient complained of persistent jactitation of the right eyelid, which was controlled by pressure opposite the infraorbital foramen. The removal of a carious tooth upon the same side resulted in permanent relief. Lander Brinton (*Dent. Misc.*, 1880, page 241) described a somewhat similar case in which



twitching of the eyelid occurred after extraction of a diseased root and lasted until the wound healed.

Conjunctivitis has been attributed to diseases of the teeth by Förster, Kempton and others, and relief has been induced by extraction of the offending teeth. Iritis with external inflammation of the eye of fifteen days' duration coexisting with intense dental neuralgia of the same side has been cited by Galezowski (*Jour. d' Opth. Tome I*). That affections of the eye may affect the teeth is further shown by J. Hutchinson (*London Med. Mirror*, 1869) in the case reported by him in which acute ulcers of the cornea from injury with hypopyon, chemosis, and pain caused the patient to complain that his eyes made his teeth and ears ache.

Disturbance of the extraocular muscles by dental disease is also a well-known clinical fact. Hancock (*Lancet*, 1859) described a case of divergent strabismus and ptosis, and Ely (*Med. Record*, 1882) reported three cases of ocular palsy in which diseased teeth were the cause, removal of which resulted in cure. Spasm of the eyelid from a similar cause was reported by S. J. Hutchinson (*Med. and Surg. Reporter*, 1885).

The effect upon accommodation of diseased teeth has been casually mentioned, but of more value are the results of Herman Schmidt's (*Archiv. für Ophthal.*, XIV) examinations of ninety-two persons with dental affections. He found that in seventy-three the accommodative effort was markedly deficient.

Purulent inflammation at the roots of teeth is occasionally the cause of serious affections of the orbit, and the possibility of its occurrence should never be overlooked. In a case recorded by Simon Snell (*Opth. Review*, 1890, page 193) a sinus was formed in the left orbit which was directly associated with disease of the right upper central incisor in a girl seventeen years of age. The dental condition followed an injury received five years previous. S. M. Burnett (*Arch. Opth.*, N. Y., 1885, pages 177-180) adds to the literature on this subject the report of a case of great swelling of the eyelids and face following an unsuccessful attempt to extract the upper cuspid tooth on the left side. As a result purulent infection occurred, with abscess of the orbit, atrophy of the optic disk, obliteration of the retinal blood-vessels, and total blindness four months later.

Discussion upon the interesting relationship between the eyes and the teeth would be incomplete without reference to the so-called neuroparalytic ulcers of the cornea due to palsy of the trifacial nerve. In these cases there is always a possibility of some dental infection being the cause or a sequel of the nerve condition. Of equal interest is the peculiar trifacial neuralgia associated with sympathetic ophthalmia, irido-cyclitis, and acute glaucoma. In such cases the pain may be attributed to some dental affection by the casual observer and be attended by serious consequences. All cases of obscure trifacial neuralgia therefore necessitate careful examination of the structures, such as the eyes and teeth, to which its filaments are distributed.

Intractable ulcers in children are nearly always associated with dental caries, and my experience has been that unless the teeth are properly attended to it is useless to continue local remedies to the eyes. It is my invariable rule to have all hospital cases of this character referred to the dental department for an examination of their teeth.

*Conclusions.* 1. By reason of the trophic as well as the sensory filaments distributed to the eyes and teeth through the medium of the fifth or trifacial nerve the structures are often the subjects of nutritional disorders secondary to general nutritional disturbances of the entire economy. This is exemplified by the association of Hutchinson's teeth and rachitic teeth with syphilitic and other forms of corneal inflammation.

2. Structural changes at the dental extremities of the fifth nerve may induce alterations in the nutrition of the ocular structures by dispersing the innervation of that nerve as pain in twitchings.

3. Pathologic changes in either of the eyes may be secondary to affections of the teeth, or vice versa as the result of extension of inflammation along the nerve or reflexly.

4. Trigeminal or trifacial neuralgia in a given case may be due to ocular conditions such as previously mentioned, or dental diseases, or both.

5. In all cases in which pain along the fifth nerve is apparently referred to the teeth, but fails to be relieved by appropriate treatment of those structures, a thorough examination of the eyes should be made. On the other hand, diseases of the eye, particularly when

attended by similar pains that do not yield to treatment, necessitate attention to the teeth, as when diseased they retard the recovery, even if not directly causal.

6. In ocular affections complicated by disease of the teeth the dental surgeon should not be misled by the occurrence of trifacial neuralgia and attribute it to the dental condition. This is a serious error, as such neuralgia is an almost constant accompaniment of serious conditions, such as irido-cyclitis, glaucoma, etc., and demands the care of a skilled ophthalmologist.

Discussion. *Dr. C. V. Kratzer, Reading:* We all remember the admirable paper on "Gold Blindness" which Dr. Fox read before this Society a few years ago (*DENTAL DIGEST*, April, 1901, page 266), and the valuable hints given therein respecting the care of our eyes and general health. We should all be aware of the intimate nervous relation between the teeth and eyes, and know that there may be pathological reflexes from one to the other, and in cases where we are unable to find any local cause for dental disturbance, especially where there is a suspicion of eye trouble, this knowledge should prompt us to refer such patients to an ophthalmologist.

*Dr. N. H. Myers:* A patient came to my office and complained of intense pain in a tooth which was also very sensitive. After an examination I suggested extracting it, but she would not consent to this and went to another dentist who devitalized the pulp. Inflammation set in and the pain became more intense, spreading to the ear and finally causing her to become deaf. She then came back to me, and believing that the trouble was still in the tooth I extracted it. Two days later the pain had entirely disappeared and her hearing had returned.

*Dr. James Truman, Philadelphia:* The intimate relation between the eye and ear must be understood before a scientific and correct diagnosis of a pathological condition can be reached. We are fully aware of the fact that diseases of the teeth produce facial neuralgia. This is demonstrated in infancy but becomes more pronounced in later years, for as the second molar comes down from the ramus it produces reflex disturbances about the ninth year of age. We are all familiar with the troubles resulting from impaction of the third molar. If we cannot locate the cause of trouble in these reflex disturbances it is our duty to pass the patient over to the ophthal-

mologist. We must have reciprocity of science and medicine if we wish to practice dentistry properly.

*Dr. W. F. Litch*, Philadelphia: That there is an intimate nervous relation between the eyes and the teeth has long been recognized in a general way, but the fact has too often been lost sight of in the diagnosis of obscure cases. Dr. Fox's paper cannot fail to receive wide recognition as a valuable contribution to the literature of the subject.

*Dr. C. S. Beck*, Wilkesbarre: A woman, forty years old, had been suffering severe pain in her head and face for some time. She went to an oculist who tested her eyes, treated them, and did all that an oculist could do for a patient, until both of them became weary of trying without obtaining results. He finally suggested that there might be something the matter with her mouth, but she thought this absurd, as all of her teeth had been extracted and she was wearing a full upper denture. She came to me, however, and on examination I discovered a slight elevation in the mesial line above the ridge. I probed only a little way beneath the surface and struck something which felt like enamel. The patient insisted that all her teeth had been removed, but I put her under ether and extracted a tooth. She recovered at once and the pain disappeared entirely.

*Dr. H. C. Register*, Philadelphia: I have had several cases where the cause of disturbance has been obscure, but I wish to record one case especially where the pain was intense. The patient was a woman, fifty-five years old, and had been under the care of a physician and an ophthalmologist for a long time. She suffered intense pain in her eyes, extending to the region of the cerebellum, and had been kept in a dark room and under the influence of anodynes. Both of the men in attendance had done all they could, but the patient still suffered. The physician requested me to look at her mouth, and on examination I found that two of the bicuspid's responded abnormally to thermal influences while the others were normal. I drilled into the pulp chambers of these two teeth and found that the pulps were restricted to within a fourth of their length by a band of dentin which was maintaining constant pressure. I devitalized and removed the pulps, finding minute granules in their substance, and after this simple operation the patient became a well woman and the pain disappeared.